

WEATHER AND CIRCULATION OF OCTOBER 1971

Continued Cold in the West and Warm in the East

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1. MEAN CIRCULATION

One of the striking features of the monthly mean circulation during October 1971 (figs. 1, 2) was the development of a vigorous polar vortex. This, together with a girdle of above-normal heights at midlatitudes, resulted in a hemispheric band of strong westerlies at upper midlatitudes.

Relative to normal, it is apparent (fig. 3) that the greatest westerly wind increase was from the mid-Atlantic across Asia to Alaska. Although there was little change in location of the Atlantic trough from September (Tau-

bensee 1971) to October, increasing westerlies over the North Atlantic were associated with progression of the downstream European trough. Intensification of the latter circulation feature during October (fig. 3) was notable. Northern portions of this trough, embedded in the main band of the westerlies, progressed more rapidly than southern portions leading to a strong northeast-southwest tilt and accompanying northward momentum transport. Elsewhere over Asia, the strongly increasing westerlies were accompanied by progression leading to a mid-Asia ridge and Sea of Japan trough, and by the rapid decline of heights in northeast Asia (fig. 3).

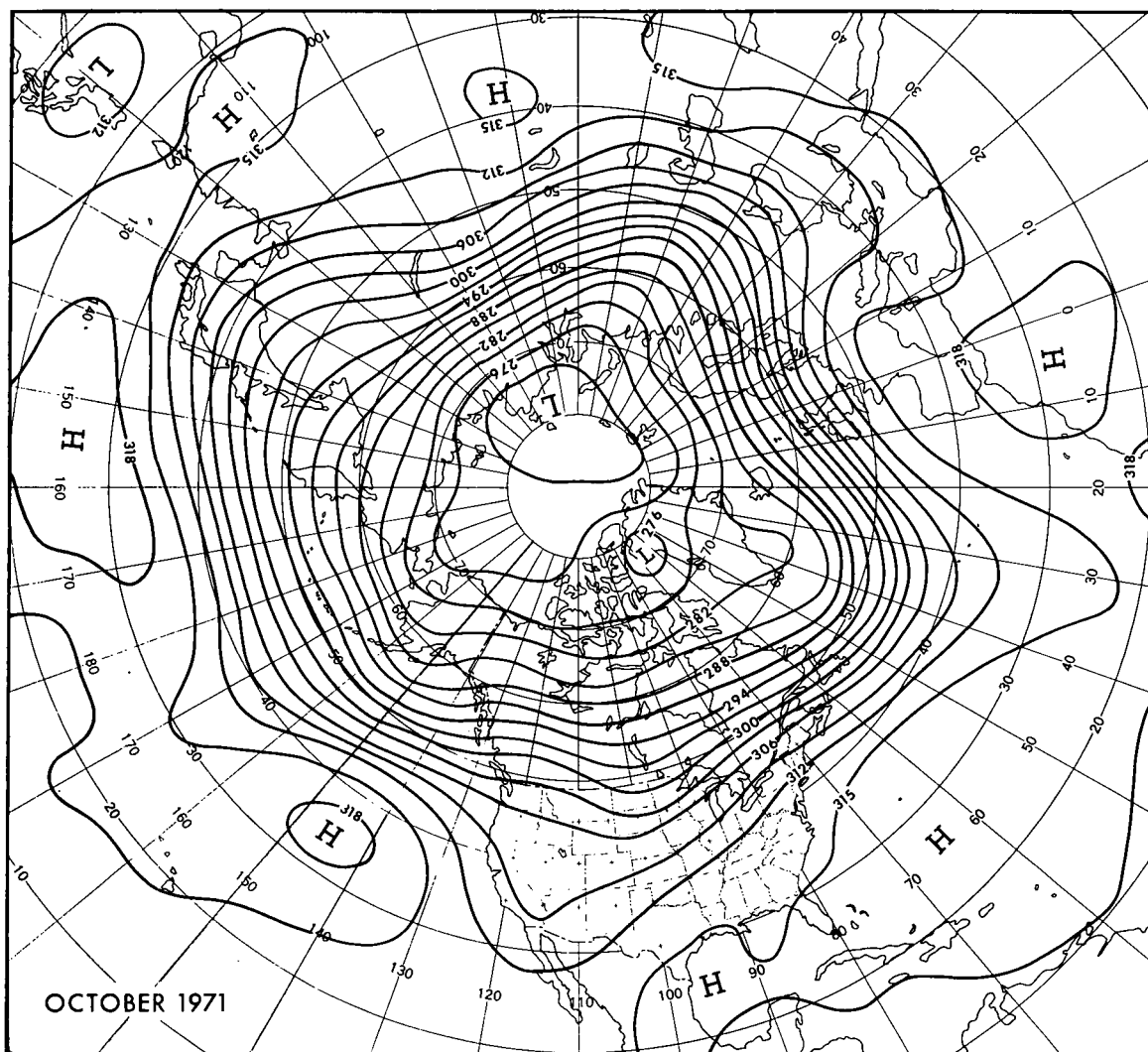


FIGURE 1.—Mean 700-mb contours in dekameters (dam) for October 1971.

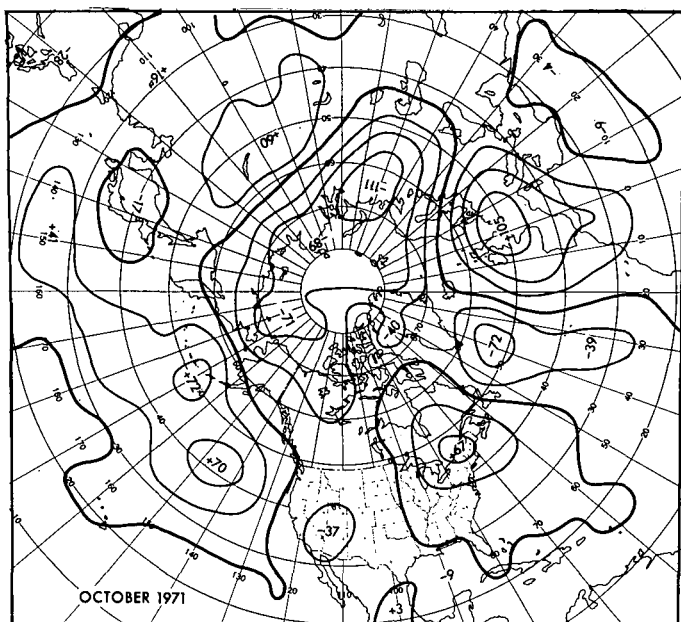


FIGURE 2.—Departure from normal of mean 700-mb height (m) for October 1971.

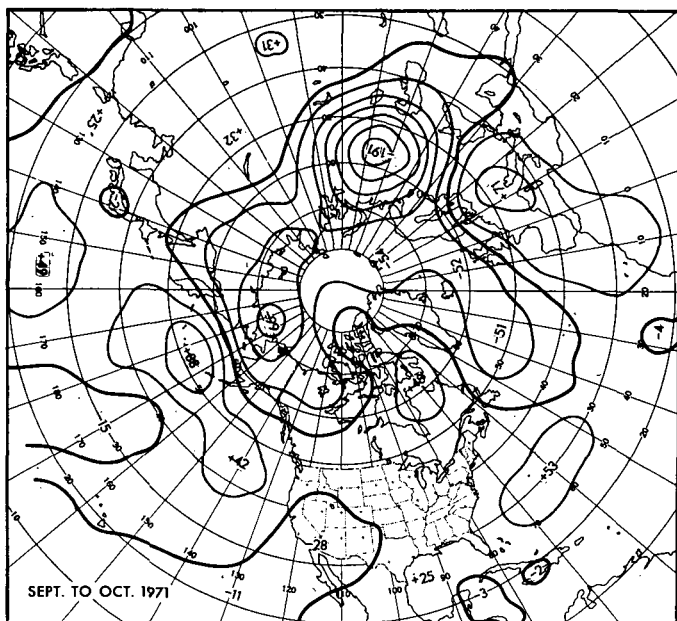


FIGURE 3.—Mean 700-mb height anomaly change (m) from September to October 1971.

Above-normal 700-mb heights over most of the Pacific (fig. 2) are indicative of the weakness of storms emanating from the Asiatic coastal trough during the month. With a stronger than normal 700-mb ridge south of Japan, typhoon activity was confined to low latitudes and contributed to a mean 700-mb Low over the Philippines.

In the 30°–40°N latitude band over the Pacific, a fairly regular wave spacing was observed with mean troughs near both coastlines and in mid-Pacific and strong mean ridges in both the eastern and western Pacific. Each of these features progressed from its September location. To the north, the previously noted increase in the westerlies

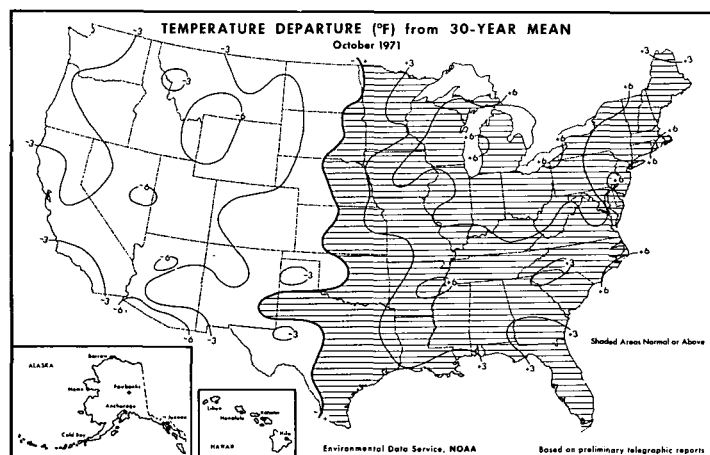


FIGURE 4.—Departure from normal of average surface temperature (°F) for October 1971 (from Environmental Data Service and Statistical Reporting Service 1971).

was associated with shearing of September's full latitude central Pacific trough.

The complex double trough structure over the western United States in September simplified somewhat during October as the westernmost trough progressed and deepened, yielding one strongly sloping trough from the Southwest to the Dakotas. In the East, a strong ridge was observed from New York to James Bay, very near the previous month's location. Over the Southeast, however, a weak trough supplanted an earlier ridge. The gross 700-mb height anomaly pattern over the United States (fig. 2) persisted from September to October.

2. TEMPERATURE

In view of the persistent height anomaly pattern over the United States from September to October, it is not surprising that there was also a good deal of persistence in the temperature pattern. Progression and deepening of the trough into the Southwest, however, transported cold air farther to the west in October resulting in below-normal temperatures over the entire western half of the Nation (fig. 4). Over the eastern half, above-normal heights and southerly flow relative to normal brought widespread above-normal mean temperatures approaching record proportions from the Midwest to the Atlantic Coast.

3. PRECIPITATION

An extensive area of above-normal precipitation extended from the central and southern Intermountain Region to the Mississippi Valley during October (fig. 5). This was associated with the movement of numerous short waves into the western mean trough and the generation of a series of intense storm systems that moved from Colorado through the north-central states. These storms brought near-record October precipitation to parts of the Northern Plains and northern Mississippi Valley, and record October snowfall was reported from

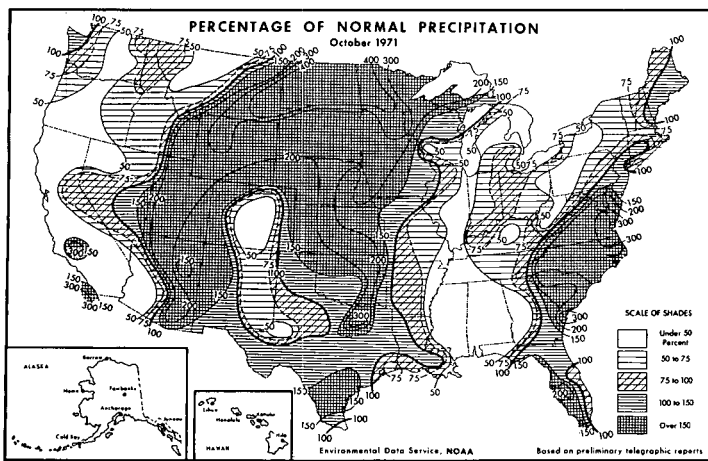


FIGURE 5.—Percentage of normal precipitation for October 1971 (from Environmental Data Service and Statistical Reporting Service 1971).

northern Arizona to Wyoming. One of the most impressive totals was at Lander, Wyo., where a record 39.9 in. of snow fell during October. Above-normal precipitation was also observed in the Middle and South Atlantic Coast states in connection with the mean trough in the Southeast. Low pressure systems in this region of sluggish upper flow were generally slow-moving, contributing to record October precipitation at some stations along the Middle Atlantic Coast.

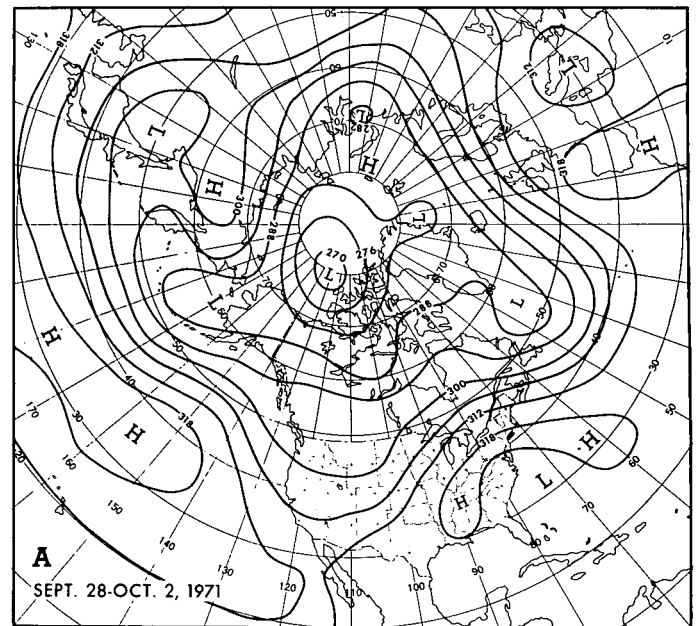
Between these two storm-associated wet areas, a band of subnormal precipitation was observed, stretching from the Gulf of Mexico to the Great Lakes. Other dry areas during the month were located to the rear of the western mean trough and to the leeward of the Southern Rocky Mountains, a rain shadow effect.

4. VARIABILITY WITHIN THE MONTH

Weekly distributions of temperature and precipitation accompanied by appropriate 5-day mean 700-mb maps are shown in figures 6–10.

Early in the month (figs. 6, 7), many circulation features around the hemisphere were progressive. In one week's time, a mean trough traversed the United States bringing a phase change in the contour pattern of that area. The wave pattern over Europe remained nearly stationary, however, with upstream progression accommodated by the filling of midlatitude portions of the Atlantic trough.

By midmonth (fig. 8), relative motion of high- and low-latitude wave trains had produced out-of-phase patterns yielding a band of fast, low amplitude flow from eastern North America to the west coast of Asia and rendering continuity unclear. Over the Pacific, the interaction of high- and low-latitude wave trains was associated with the return of a strong upper ridge to the east Pacific, reinstating a trough in the western United States and a ridge in the East. During the last half of the month, there was a trend toward the rephasing of high- and low-latitude wave components with resultant amplification



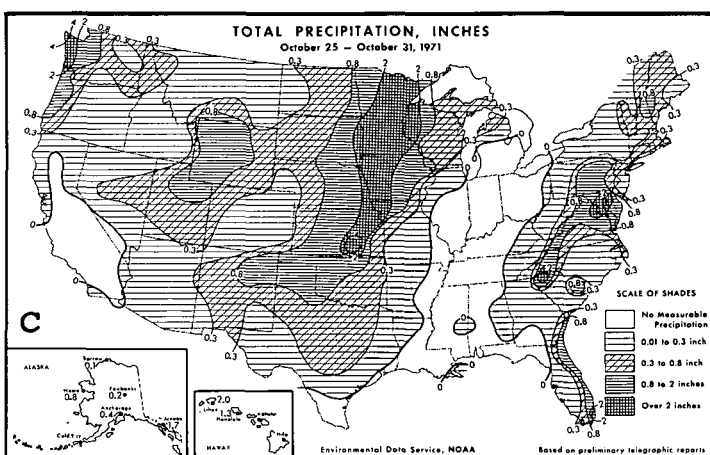
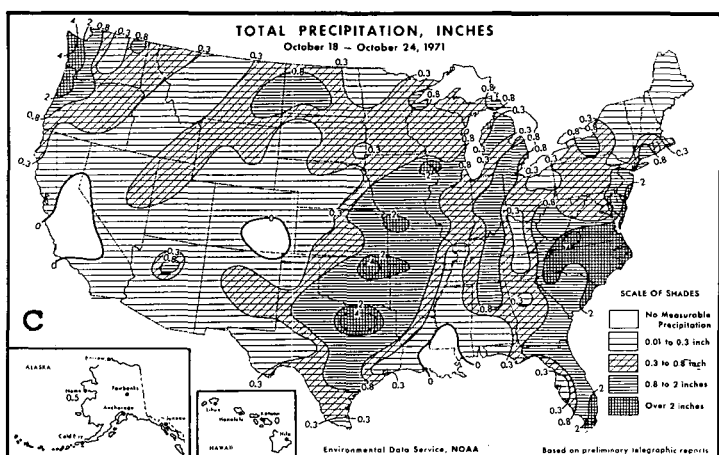
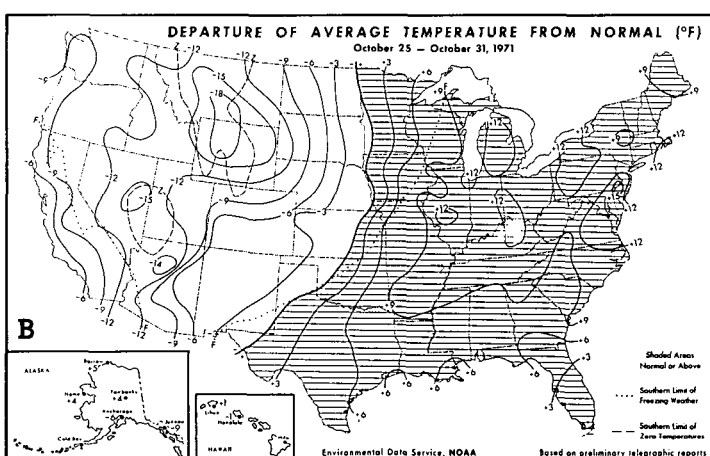
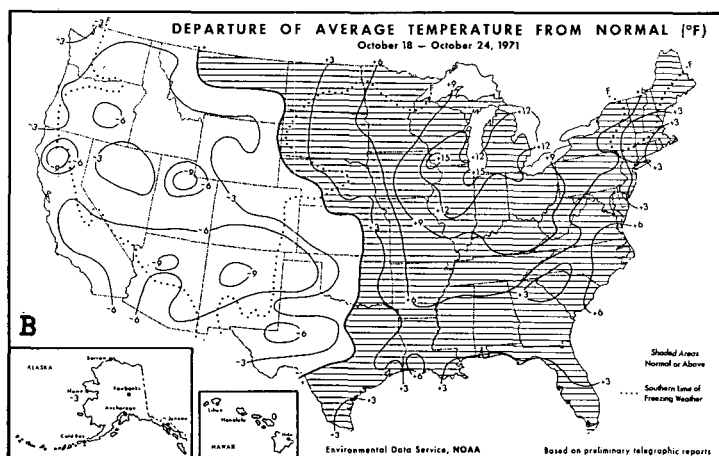
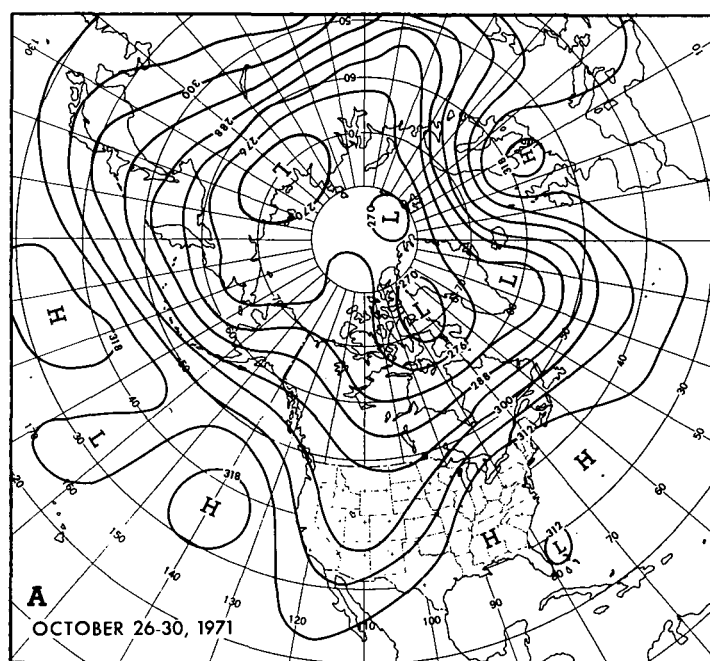
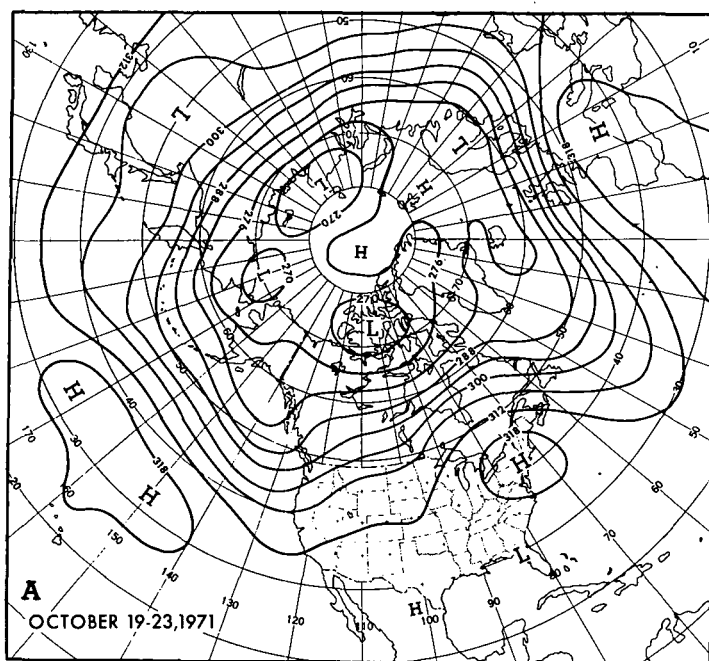


FIGURE 9.—Same as figure 6, (A) for Oct. 19-23, 1971; (B) and (C) for week of Oct. 18-24, 1971.

FIGURE 10.—Same as figure 6, (A) for Oct. 26-30, 1971; (B) and (C) for week of Oct. 25-31, 1971.

brought extensive areas of precipitation from the Great Basin to the Mississippi Valley during these periods. As noted earlier, much of this precipitation in the West was

in the form of snow that had a refrigerating effect on cold air masses advected over that area. These circumstances produced record-breaking October minimum tempera-

tures over most of the western quarter of the Nation. They occurred on October 28 or 29 in the North and on the 30th in the South.

During periods when the ridge in the eastern United States was most amplified (figs. 6, 9, 10), easterly surface flow coupled with slow moving low-pressure areas was dominant in the Southeast, producing widespread precipitation along the eastern seaboard. Prominent among these Lows was the remnant of hurricane Ginger (no longer of hurricane strength) which moved through North Carolina and southeastern Virginia on the first three days of the month.

The October 4–10 period (fig. 7), with a mean ridge in the West and mean trough in the East, was the only week of the month that was warm and dry over the western half of the country and cold in the East. During this period, cold fronts penetrated to the Gulf and East

Coasts producing moderately heavy precipitation in the South and along the eastern seaboard. The October 11–17 period (fig. 8) was a transitional one with some characteristics of both previously discussed regimes.

Four tropical storms reached typhoon proportions in the west Pacific during the month. Each of these formed in the strong easterlies east of the Philippines and moved across the Islands.

REFERENCES

- Environmental Data Service, NOAA, U.S. Department of Commerce, and Statistical Reporting Service, U.S. Department of Agriculture, *Weekly Weather and Crop Bulletin*, Vol. 58, Nos. 40–45, Oct. 4, 11, 18, 25, and Nov. 1 and 8, **1971**.
Taubensee, Robert E., "Weather and Circulation of September 1971—Cool in the West and Warm in the East, A Reversal from August," *Monthly Weather Review*, Vol. 99, No. 12, Dec. **1971**, pp. 980–986.